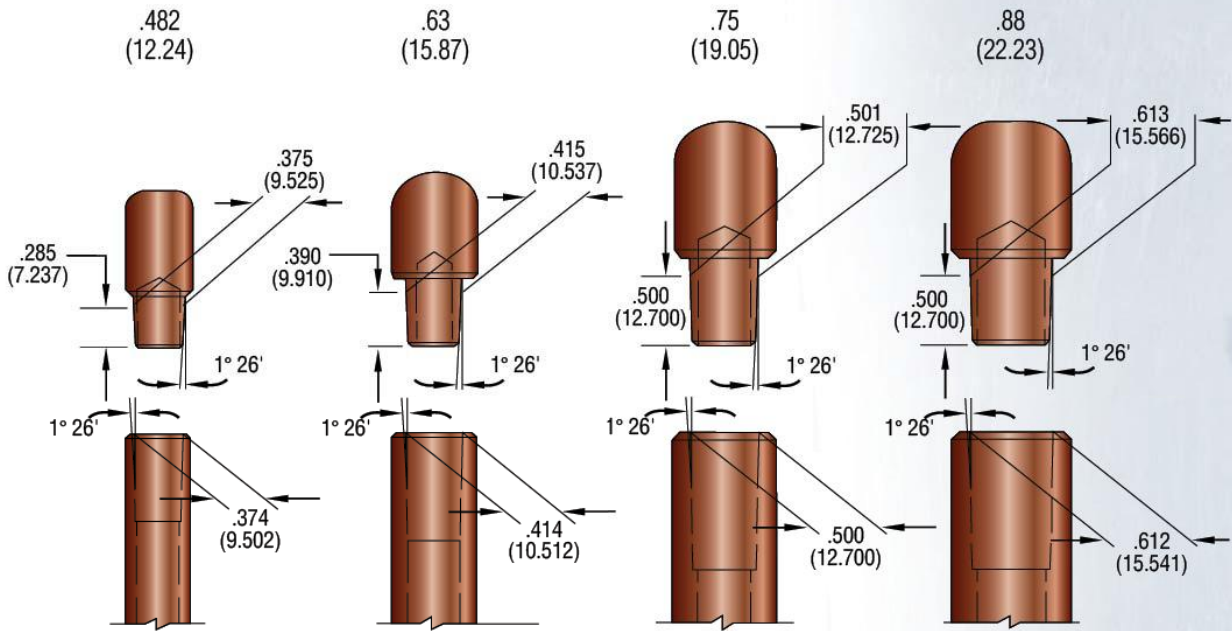
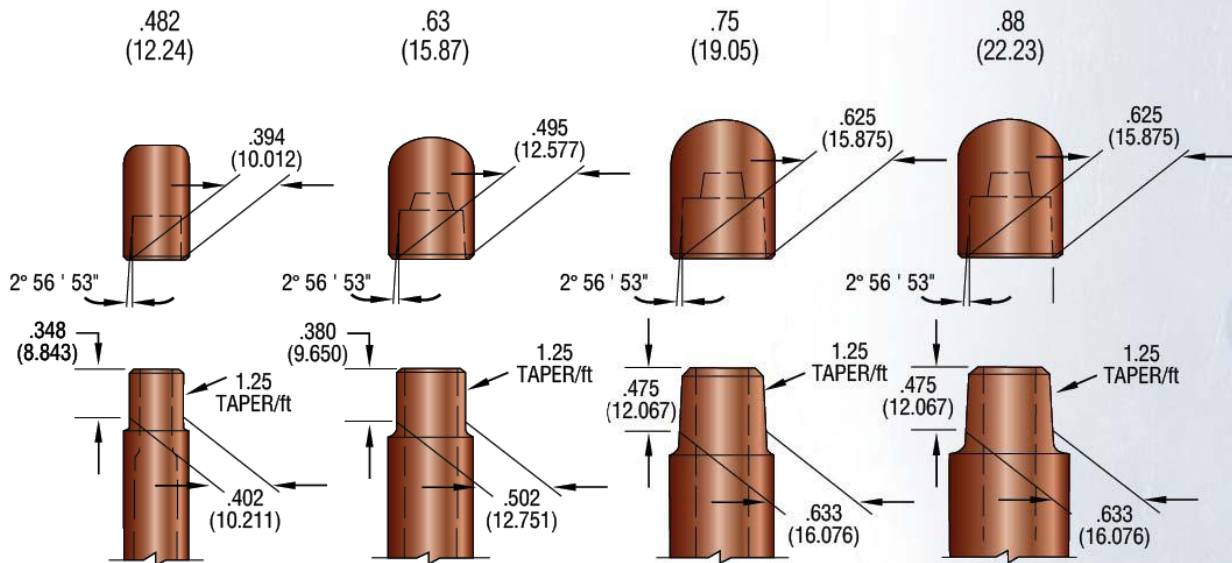


REFERENCE DATA

Male Cap Data



Female Cap Data



• Dimensions Shown Are: inches (mm).



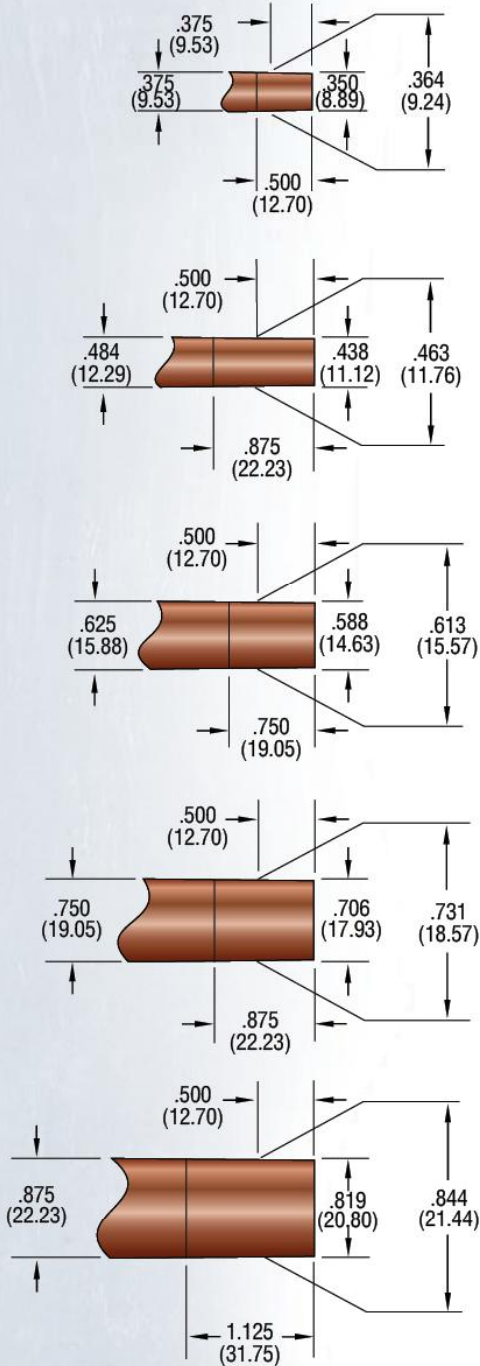
REFERENCE DATA

Straight Female Adapter Shanks For Male Caps

ELECTRODE AND ADAPTER TAPERS

(Refer to pages 3-12 to 3-14)

CAP TAPERS



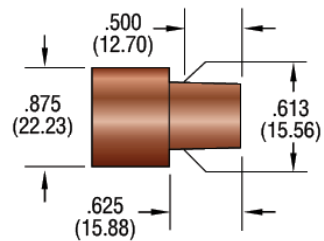
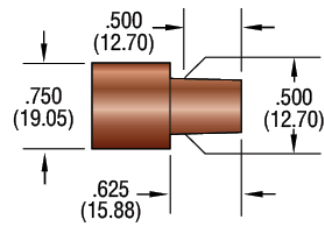
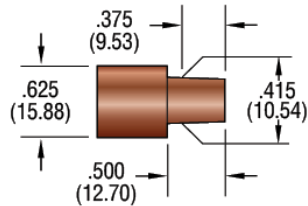
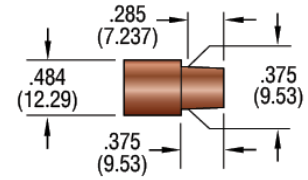
#0 MT - #3 RW

#1 MT - #4 RW

#2 MT - #5 RW

#6 RW

#3 MT - #7 RW



• Dimensions Shown Are: inches (mm).

REFERENCE DATA

RWMA Recommended Electrode Materials
For Spot Welding

SIMILAR FERROUS METALS

ALLOY 1 **	Stainless Steel		Galvanized Steel		Tin Plate		Terne Plate		Cadmium Plate		Chrome Plate		Cold-Rolled Steel	
ALLOY 1 **	A	2,3*	A	1,2,20	B	1,2,20	A	1,2,20	A	1,2,20	A	2	A	2
	2,3*			1,2,20		1,2,20		1,2,20		1,2,20		2		2

DISSIMILAR NONFERROUS METALS

ALLOY 1 **	Aluminum & Aluminum Alloys		Copper		Nickel-Silver		Nickel & Nickel Alloys		Phosphor Bronze		Yellow Brass		Red Brass	
ALLOY 1 **	A	1	C	13,14	A	2	A	2	A	2	A	2	A	2
	1		13,14		2		2		2		2		2	
ALLOY 1 **	Titanium		Silicon		Bronze		Cupro		Nickel		Magnesium			
	A	2,3	A	2	B	2	A	2	B	2	B	1		
	2,3		2		2		2		2		1			

REFRACTORY METALS

ALLOY 1 → ALLOY 2 ↓	Tungsten Molybdenum		Chrome Plate		Stainless Steel		Nickel & Nickel Alloys	
Tungsten Molybdenum	B	2	B	2	B	2,3*	B	2
	2		2		2		2	

DISSIMILAR FERROUS METALS

ALLOY 1 → ALLOY 2 ↓	Nickel & Nickel Alloy		Cold-Rolled Steel		Tin Plate		Terne Plate		Galvanized Steel		Cadmium Plate		Chrome Plate	
Stainless Steel	B	2	A	2	B	1,2,20	B	1,2,20	B	1,2,20	B	1,2,20	B	2
	2,3*		2,3*		2,3*		2,3*		2,3*		2,3*		2,3*	
Chrome Plate	B	2	B	2	B	1,2,20	B	1,2,20	B	1,2,20	B	1,2,20		
	2		2		2		2		2		2			
Cadmium Plate	B	2	B	2	C	1,2,20	B	1,2,20	B	1,2,20				
	1,2,20		2		1,2,20		1,2,20		1,2,20					
Galvanized Steel	C	2	B	2	B	1,2,20	C	1,2,20						
	1,2,20		1,2,20		1,2,20		1,2,20							
Terne Plate	C	2	B	2	C	1,2,20								
	1,2,20		1,2,20		1,2,20									
Tin Plate	C	2	B	2										
	1,2,20		1,2,20											
Cold-Rolled Plate	C	2												
	2													

DISSIMILAR NONFERROUS METALS

ALLOY 1 → ALLOY 2 ↓	Nickel & Nickel Alloy		Phosphor Bronze		Silicon Bronze		Nickel-Silver		Cupro Nickel		Yellow Brass		Red Brass	
Copper			C	2	C	1,2,20	C	1,2,20	C	1,2,20	C	1,2,20	C	2
			14		14		14		14		14		14	
Red Brass	C	2	C	2	C	2	C	2	C	2	C	2		
	14		14		14		14		14		2			
Yellow Brass	C	2,10*	B	2	B	2	B	2	B	2				
	2		11		11		11		11					
Cupro Nickel	B	2	B	2	B	2	B	2						
	2		2		2		2							
Nickel-Silver	B	2,10*	B	2	B	2								
	1,2,20		1,2,20		1,2,20									
Silicon Bronze	C	2,10*	B	2										
	2		2											
Phosphor Bronze	C	2												
	2													

BLOCK INTERPRETATION	
WELDABILITY A=Excellent, B=Good, C=Fair	ELECTRODE CONTACTING ALLOY 1
ELECTRODE CONTACTING ALLOY 2	

* Electrode materials are second choices
** Alloy 1=Alloy 2 (refer to block interpretation)

- ALLOYS**
 1=Class 1 10=Class 10 14=Class 14
 2=Class 2 11=Class 11 20=Class 20
 3=Class 3 13=Class 13



REFERENCE DATA

GROUP A - COPPER BASE ALLOYS										
CLASS	RWMA NO.	GENERAL USE	DESCRIPTION	AVAILABILITY*						
				1	2	3	4	5	6	
RWMA CLASS 1										
ZIRCONIUM	1.15000	Electrodes for welding aluminum alloys, magnesium alloys, coated materials, brass and bronzes. Can be used for both spot and seam welding.	A specially heat treated zirconium copper alloy that meets the minimum electrical conductivity and hardness specification of Class 1 Alloy.		x	x				
CADMIUM	1.16200		A high conductivity cadmium copper alloy, not heat treatable, but can be work hardened.		x	x				
RWMA CLASS 2										
CHROMIUM- ZIRCONIUM	2.18150	These materials are stronger than Class 1 materials but have slightly lower conductivity. They are used for the spot and seam welding of cold and hot rolled steel, stainless steel and low conductivity brass & bronze. They are also used as flash welding dies, and as electrodes for the welding of steel & other coated materials.	A specially heat treated chromium zirconium copper alloy that meets the minimum electrical and hardness specification of Class 2 Alloys.	x	x	x				
CHROMIUM	2.18200		A high conductivity chromium copper alloy, that obtains its optimum properties from a combination of both heat treatment and cold work.	x	x	x	x	x		
RWMA CLASS 3										
COBALT-BERYLLIUM COPPER	3.17500	Their high hardness makes them ideal for electrodes for the spot and seam welding of high resistance materials such as stainless steel, nichrome and monel metal. As a casting, they are used for flash, butt and projection welding electrodes & fixtures. They can also be used for seam welder bearing and other current carrying structural parts.	Heat treatable copper alloys with a combination of high tensile strength and good electrical and thermal conductivity.	x	x	x	x	x		
NICKEL-BERYLLIUM COPPER	3.17500			x	x	x	x	x		
BERYLLIUM-FREE COPPER	3.18000			x	x	x	x			
RWMA CLASS 4										
BERYLLIUM	4.17200	Electrode material for special flash, flash butt and projection welding applications where pressures are extremely high and wear is severe but where heat is not excessive. Used in the form of inserts & facings.	A heat treatable copper alloy having the unusual combination of very high strength and lower electrical conductivity than Class 3. Can be annealed, machined & reheat treated to regain its properties.	x	x	x	x	x		
RWMA CLASS 5										
ALUMINIUM	5.95300	Typical uses are flash welding electrodes, secondary circuit welder arms, knees, platens and other current carrying fixtures where high strength, wear resistance and non-magnetic properties are required.	Copper base alloy usually furnished in the form of castings. It is not heat treatable.	x						

Continued on next page.

REFERENCE DATA

GROUP B - REFRACTORY METAL COMPOSITION											
CLASS	RWMA NO.	GENERAL USE	DESCRIPTION	AVAILABILITY*							
				1	2	3	4	5	6		
RWMA CLASS 10											
COPPER-TUNGSTEN	10.7445	Flash and butt welding electrodes where higher electrical and thermal conductivity is necessary and where a degree of malleability is desired. They can also be used for spot welding low conductivity steels -- stainless.	A powder metallurgical combination of 45% copper & 55% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals of superior wear resistance and strength at elevated temperatures.			X					X
RWMA CLASS 11											
COPPER-TUNGSTEN	11.744	Projection welding electrodes, flash & butt welding electrodes, light upsetting electroforming & seam welder bushings. Harder than Class 10 & used where moderate pressure required.	A powder metallurgical combination of 25% copper and 75% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals with good thermal & electrical conductivity.				X				X
RWMA CLASS 12											
COPPER-TUNGSTEN	12.7435	Heavy duty projection welding electrodes electro-forming & electroforming electrodes, electrode facing for upsetting of studs and rivets, cross wire welding of large diameter wire and rod.	A powder metallurgical combination of 20% copper and 80% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals of superior wear resistance and strength at elevated temperatures.			X					X
RWMA CLASS 13											
TUNGSTEN	13.74300	Cross wire welding of copper & brass electro brazing and some electro upsetting. Welding of braided copper wire to other materials.	Tungsten is extremely hard and has low ductility. It cannot be machined but can be ground to required contours. It does not alloy with non-ferrous materials.			X	X				X
RWMA CLASS 14											
MOLYBDENUM	14.42300	Cross wire welding of copper & brass electro brazing and some electro upsetting. Welding of braided copper wire to other materials.	Molybdenum is not as hard as Class 13 and can be drilled and machined to special contours.			X	X	X	X		X
GROUP C - SPECIALTY MATERIAL											
RWMA CLASS 20											
DISPERSION STRENGTHENED COPPER	20.15760	Welding of metallic coated metal such as galvanized steel, tern plate, etc.	A powder metallurgy material consisting of copper and aluminum oxide with high temperature hardness and physical properties different than the copper alloys.		X	X					
<p>*AVAILABILITY CODING EXPLANATION</p> <ul style="list-style-type: none"> • 1 = CASTING • 2 = FORGING • 3 = ROD & BAR • 4 = PLATE • 5 = TUBE • 6 = INSERTS <p>• GENERAL SUGGESTED APPLICATIONS, NOT TO BE INTERPRETED AS THE OPTIMUM FOR ANY SPECIFIC APPLICATION</p>											



REFERENCE DATA

OVEREXPOSURE EFFECTS						
TYPE/LOCATION OF OVEREXPOSURE	RWMA CLASS 1	RWMA CLASS 2	RWMA CLASS 3	ZIRCONIUM	TUNGSTEN	GLIDCOP
Skin: Irritation with possible discoloration of skin or hair.	X	X		X	X	N/A
Skin: Irritation with possible discoloration of skin (Copper). On broken skin, can cause granulomatous lesions (hard with a central non-healing core) (Beryllium). Cobalt can cause an allergic sensitivity even with very low exposures. Often expressed as eruptions in creases of elbow, knee, ankles and neck.			X			
Inhalation: Upper respiratory tract irritation, metallic taste in mouth, nausea, metal fume fever (sensation of chills and stuffiness of the head and weakness). Possible lesions on nasal passages.	X	X		X	X	N/A
Inhalation: Upper respiratory tract irritation, metallic taste in mouth, nausea, metal fume fever (sensation of chills and stuffiness of the head and weakness). Possible lesions on nasal passages (Copper). Cough, substernal pain, moderate shortness of breath, some weight loss (Beryllium). Chronic Beryllium disease can be from non-disabling to severely disabling. High Cobalt inhalation levels can cause asthma-like symptoms to interstitial pneumonia with fibrosis in severe cases.			X			
Eyes: Metal particles penetrating the eyes may cause irritation discoloration and damage.	X	X		X	X	X
Eyes: Copper particles penetrating the eye may cause irritation discoloration and damage. Beryllium dust and fumes may cause irritation and conjunctivitis.			X			
Cadmium – reported to increase incidence of prostate cancer.		X				
Beryllium & Nickel – classed as suspect of carcinogenic potential for man.			X			
Chromium – dust and fumes can cause skin and pulmonary sensitization and is corrosive. Overexposure is unlikely to occur.		X				
REACTIVITY						
Hazardous Polymerization: Will not occur. Stability: Stable Incompatibility: Dust or fume contact / acetylene gas may cause formation of copper acetylenes which are sensitive to shock.	X	X	X	X		X
Hazardous Decomposition Products: Melting may generate harmful fumes.					X	
EMERGENCY & FIRST AID PROCEDURES	Skin: Wash contaminated skin using soap or mild detergent and water. If irritation persists after washing, get medical attention. Eyes: Wash eyes immediately with large amounts of water, lifting lower and upper lids occasionally. Get medical attention immediately.					